The 'quiet' revolution

Roy Szweda, Associate Editor

Epi is seldom out of the news these days. In this issue you will read of yet more incredible deals and sales orders. For example, EMCORE now has 51 reactors in the field for GaN alone. So the total installed base just for this material must be over a hundred systems. Such statistics beg the question: where is all this capacity going? Demand for opto devices is already greater than US$6 billion* and growing at 16% per year, outclassed only by demand for electronic devices such as HBTs.

Having access to epiwafering has become an industry preoccupation. This is currently being achieved by all means possible - captive or merchant supply, acquisitions, mergers, joint ventures, etc. It has become essential to have epi if you are to capture and hold marketshare in devices. This equates to more sales of either MOVPE or MBE. The choice depends on your target market - a discussion of the relative strengths of each approach can't be covered in this short editorial, it merits at least a whole article all of its own.

Behind the headlines, factories worldwide are optimizing the mass production of billions of opto and electronic devices per annum. LPE/VPE have become yesterday's technologies. LPE is deemed inflexible and cannot be used for the popular short wavelength red LEDs where the human eye is most sensitive, so many companies are now also using MOVPE for red LEDs instead of the traditional LPE. This is but one example.

In only the past few years, MOVPE's success has included AlInGaP/GaP amber LEDs and of course III-nitride blue-green LEDs, and InGaP HBTs in electronics. The list goes on. MOVPE is becoming the dominant growth method for III-V opto. The reason for this is that all the big growth areas in opto require MOVPE: HB-LEDs, blue LEDs, high power diode lasers, VCSEL lasers, visible lasers, detectors, etc. These show the highest growth rates and almost all are being fabricated using MOVPE. So it is likely that MOVPE will soon have taken a third of the market. If you also throw in the contribution to the MOVPE total from solar cells for communication satellites (c. 10 million sq. in. of germanium substrates per year) MOVPE's position is unassailable and getting stronger.

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MOVPE is suitable for R&D through to production and is at its best when dealing with very high volumes. With LPE or VPE you can process only single wafers at a time so you need many of these machines for mass-production. Up until recently this was the common practice - and indeed is still the situation in many cases.

There are now, however, MBE and MOVPE reactors having true multiwafer capability utilizing the economics of circular, large wafers (up to 6-in, even though most users still use only 2-in wafers). Since opto devices have not, unlike MMICs etc., increased in die size much over the past few years, orders of magnitude more of them can be produced in a single multiwafer growth run. A machine such as the AIXTRON G3 is worth a factory full of LPE reactors.

Quite possibly the highest specification MBE epi machine in existence is the VG150 from VG Semicon, which already has more than one customer. You would need your own substrate factory to feed this monster's appetite.

By the time you read this the first VG150 will be in the hands of IQE (aka QED) and others are on order. Amongst the other customers is RFMD. Between them, RFMD and its partner TRW run what they claim is the largest AlGaAs MBE facility in the world. Few will argue about size, though many question the relevance of this point.

It looks as if RFMD is expecting to use this impressive facility to meet even stronger demand for its HBTs over the next five years. Such investments have a parallel in MOVPE by virtue of the cluster of opto companies now setting up in Taiwan.

So much installed capacity is unprecedented and took many by surprise. However, the industry and its investors take note of what RFMD is doing and no doubt are watching closely to judge the success or not of this course of action.

A Strategic Study of the Worldwide Semiconductor Optoelectronic Component Industry Market Prospects to 2003, 1999, Reed Electronics Research.

0961-1290/99/$ - see front matter